CHAPTER 10: OPERATION & MAINTENANCE

OPERATION & MAINTENANCE

A stormwater-management system that is functioning properly will require regular maintenance. If sediment and other particulates are not being deposited and retained, the basin is not providing any water-quality benefits. For a detention/retention system to function as designed, it is essential that a regular inspection and maintenance program be in place. The operation & maintenance of the stormwater facilities should not be limited to occurring only when complaints are received. Instead, the maintenance program should be both "preventive" and "corrective." In addition to responding to complaints, there should also be a "preventive" portion of the inspection program which can discover small maintenance problems that can be solved with a minimal amount of effort.

There are a wide variety of maintenance problems that can be associated with detention facilities including weed & grass control, sedimentation, erosion, and outlet blockage.

The results of a survey by the American Public Works Association, 1980 are shown in table 10.1.

Table 10.1 - Maintenance Problems of Detention Facilities

Problem Type	Relative Degree of Severity 100 - most severe 0 - no problem
Weed Growth	100
Maintaining Grass	93
Sedimentation	87
Bank Deterioration	79
Mosquito Control	77
Outlet Stoppage	76
Soggy Surfaces	71
Inflow Water Pollution	69
Algal Growth	68
Fence Maintenance	66
Unsatisfactory Emergency Spillway	60
Dam Failure, Leakage	55

Some of these problems can be minimized during design. However, no matter how well a facility is designed and constructed, maintenance will be required.

Following is a list of items that should be included in a maintenance program:

1. Inspection of Outlet

Blockages. A common source of pond failure is blockage of the outlet structure. A blocked outlet will reduce the outflow capacity of a basin, and will increase the chance of structural failure. In an extended detention facility, a blocked outlet will result in shallow water being stored. Shallow water will cultivate significant weed and algae growth, and will make maintenance extremely difficult.

Thus, any inspection program must regularly check the outlet structure for blockages due to sediment or debris. Once discovered, the blockages must be removed. The inspection should be conducted at least monthly, and more frequently during the spring runoff season.

Structural Condition. The outlet structure should be inspected for cracks and spalling (deterioration) of the concrete, erosion of the embankments, differential settlement, seepage, and scour at the inlet/outlet. Any of these problems could lead to failure of the outlet structure if not corrected. The structural condition should be inspected at least annually, or following a major flood event. The Dam Safety Guidebook (reference 28) prepared for the Federal Emergency Management Agency provides some good guidance relative to inspection of the structure. A copy of this guidebook may be available from the DEQ, Land and Water Management Division, Dam Safety Unit (telephone # (517) 373-1170). Even though the Guidebook was prepared with dams in mind, many of the terms and checklists are applicable to the outlet structures for detention basins.

2. Dredging and Removal of Sediment.

Typically sediment will have to be removed every 5 to 10 years. The maintenance schedule will vary from basin to basin, as it is dependent on the watershed, and the size of the basin. A recommended practice in designing a detention basin is to include extra volume of storage to account for the volume of sediment that will be deposited in the basin. How much "extra" volume was included in the basin will be a factor in determining the frequency of clean-out. In addition, if development is occurring in the watershed, it will likely be necessary to remove sediment more frequently, as increased development will increase sediment.

It is extremely important that the design of the basins include an access point, which will allow the removal of sediment. It is also important to have a place to put the dredged materials, either on-site or off-site.

3. Mowing.

The detention ponds can be maintained as a meadow, which would require mowing at least twice a year. However, in residential areas, the mowing frequency may have to be increased to 10 to 14 times a year for "aesthetic" reasons. Thus, mowing can be a large maintenance expense. It is suggested that slow-growing, water-tolerant species, such as K-31 tall fescue and crownvetch be used to minimize the need for mowing.

4. Algae and Aquatic Plants

Since wet detention ponds will receive and store stormwater that contains nutrients, they will be able to support algae and aquatic plants. A properly designed wet detention pond will limit the plant growth to the edges of the pond.

It will be virtually impossible to eliminate the growth of algae in a wet detention pond. To try to control the algae growth it is possible to:

a) "Harvest" the algae through the use of special machinery.

b) Chemicals are available that control the growth of algae. However, the use of chemicals can contaminate the receiving waters, and thus should be avoided if possible.

c) In some instances, minnows and small fish have been used to control the growth of algae. The introduction of fish will require that the pond be designed to support fish over the winter.

d) Install a mechanical aerator to reduce odors and the growth of algae.

e) Drain the pond and clean out the bottom, which will remove the nutrients that are responsible for the growth of algae.

Extended detention basins should not experience problems with the growth of algae, as water is not retained in the basin. However, if the bottom of the basin is constructed without a slope, the bottom may remain wet, and wetland vegetation may begin to grow. If it is desired to maintain the bottom of the basin, the bottom slope should be constructed with at least a 2% slope.

5. Fences

In some instances fences are used to limit access to the basin or the outlet structure. As a safety precaution, the fence should be inspected periodically to be sure that it is functioning as it was intended.

Figure 10.1 gives a sample checklist that may be used to identify problem areas and to recommend solutions. It is suggested that about 3% to 5% of the construction cost of the facility be allocated annually to finance the maintenance program.

FINANCING OF STORMWATER-MANAGEMENT FACILITIES

A major factor in the success or failure of a stormwater-management facility is the availability of adequate finances to operate and maintain the facility. Historically, local governments and drain commissioners have been responsible for solving local drainage problems. The funding for the drainage work has usually been in the form of property taxes or a special assessment district based on contributing drainage area. Typically, maintenance of drainage structures have been given a low priority primarily due to limited funding.

CHECK LIST
OPERATION AND MAINTENANCE INSPECTION RECORD

Name of Project _____ Date of Inspection _____

Project Location _____

Type of Inspection _____

Reservoir Inspection: Satisfactory _____ Unsatisfactory _____

Item	Acceptable	Unacceptable	Required Maintenance
1. Vegetation			
2. Fences			
3. Principal Spillway			
4. Trash Racks			
5. Gates, Valves or Stoplogs			
6. Diversion Structure			
7. Energy Dissipators			
8. Reservoir Area			
9. Embankment Conditions			
10. Fill Areas			
11. Condition of Concrete			
12. Outlet Channel			
13. Pump Station			

REMARKS:

Signature of Inspector _____

Figure 10.1 - Maintenance Check List

(Source: references 28 & 35)

STORMWATER UTILITY

Throughout the country, various communities have developed methods of funding the maintenance of stormwater-management facilities. One method that is being utilized is the creation of a stormwater utility. These utilities provide services of flood control, drainage, and stormwater management, and are financed with user charges (reference 22). The user fees are typically based upon the runoff that would be anticipated from the property. In other words, a commercial property with paved parking lots would be required to pay more than a residential development due to the greater runoff potential.

The stormwater utility is different from property taxes in that tax-exempt properties (churches, schools, etc.) would be assessed the "user fee." Based on a 1990 survey by the Maryland Department of Environment (reference 34) the median stormwater-utility annual charge for single family residences was $25.80; the charges ranged from $12.84 in Roseville, Minnesota, to $89.40 in Bellevue, Washington. (The City of Ann Arbor had an annual utility charge of $18.24).

For nonresidential parcels, it is difficult to set a "typical" rate, as rates vary with the degree of impervious area. Some communities charge per square foot of impervious area (Louisville charges $1.75 per 2500 square feet of impervious area), while others charge based on type of development (see table 10.2).

There are a wide variety of methods that a stormwater-management utility can use to assess a "user fee." The degree of impervious area is considered in most methods. Whatever method is used, the primary benefit of the utility is a stable source of funds available for the operation and maintenance of the stormwater management system.

Table 10.2 - Rate Schedule for the City of Seattle

	Impervious Surface	
Class	**Percentage**	**Rate**
Residential		$ 26.07/parcel/yr
Very Light	0-10	$ 26.07/parcel/yr
Light	10-20	$ 60.83/acre/yr
Moderate	20-45	$126.01/acre/yr
Moderate heavy	45-65	$242.33/acre/yr
Heavy	65-85	$308.51/acre/yr
Very Heavy	85-100	$404.10/acre/yr
County Roads	NA	$ 90.44/acre/yr
State Highways	NA	$ 66.85/acre/yr

Special Property Tax

In the City of Novi, Oakland County, voters passed a 1/2-mill property-tax increase for stormwater facility maintenance. The City also collects fees from developers for connecting to the stormwater system. Obviously, the biggest "hurdle" in using a special property tax is getting the approval of the voters to pass the millage. Before

asking voters to vote to increase their taxes, it will be necessary to try to educate the public to the concept and benefits of stormwater management.

Lump-Sum Payment by Developers

At the time a facility design is reviewed and approved, the community may require an "front-end" payment which is earmarked for the specific site. The payment can be in the form of a permanent maintenance deposit which is invested and the interest used to fund all future maintenance costs. The other approach is a payment to cover all maintenance for a given period of time, such as 10 years.

Special Assessment District

Special assessment districts may be established by the local government, or they may be established by the County Drain Commissioner under the Michigan Drain Code, 1956 P.A. 40, as amended. Under this concept, property owners within an established drainage district are assessed a fee for the maintenance of stormwater management facilities.